Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Review of the Commission's	)	
Rules Governing the Low Power	)	MM Docket No. 93-114
Television Service	)	

Comments of the
NATIONAL ASSOCIATION OF BROADCASTERS
and the
ASSOCIATION FOR MAXIMUM SERVICE TELEVISION

The National Association of Broadcasters ("NAB")[1] and the Association for Maximum Service Television ("MSTV")[2] hereby submit comments on the Petition for Partial Reconsideration submitted by the firm of du Treil, Lundin & Rackley, Inc. ("Petition") dated June 27, 1994, in the above-referenced proceeding. In its Petition, dLR asks the Commission to reconsider dLR's suggestion, posed in their comments in this proceeding, that an LPTV applicant be allowed to propose the addition of offset, or change in the present offset, of an existing or proposed co-channel LPTV station. In its First Report and Order, the Commission refused to consider dLR's proposal, citing that the suggestion was not within the scope of this proceeding.[3] Notwithstanding the validity of the Commission's decision in this regard, there are serious technical questions concerning the use of offsets that we wish to

[1] NAB is a nonprofit, incorporated association of radio and television broadcast stations and networks. NAB serves and represents America's radio and television stations and all the major networks.

[2] MSTV is a trade association of approximately 250 local full-service broadcast stations committed to achieving the highest technical quality for the local broadcast system.

[3] See First Report and Order in MM Docket 93-114 (May 19, 1994), at n. 41.

bring to the Commission's attention.

Specifically, NAB and MSTV believe that the technical premise on which the use of offset is based is outdated and, as a result, the performance improvement available from carrier offset in typical LPTV operations may not, in fact, exist. Accordingly, a change to permit use of offsets by LPTV stations as suggested by dLR would increase the potential for interference to existing full-power and LPTV facilities.

I. Introduction.

In their original comments to the Commission in this proceeding, dLR suggested the following:

> dLR proposes that LPTV applicants be permitted to request a change in the offset of another existing, authorized or proposed LPTV station. The result will be a reduction of interference, not only between the applicant and the station being offset, but also between the newly offset station and other stations to which it was not previously offset.[4]

dLR's argument is based on the supposition that offset carrier operation[5] allows a substantially reduced minimum co-channel D/U ratio compared to non-offset carrier operation with equivalent subjective impairment assessment. Indeed, the Commission's

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[4] See Comments of duTriel, Lundin and Rackley in MM Docket 93-114, filed June 16, 1993, at 4.

[5] Offset carrier operation is illustrated in the Commission's Table of Allotments (see 47 C.F.R. §73.606) which identifies full-service stations which are required to operate with their carrier frequencies offset 10 kHz above or below the nominal carrier frequencies. LPTV service uses the same designations for offsets as full-power service.

Rules afford different co-channel protection criteria for offset versus non-offset LPTV operation: 45 dB D/U ratio for non-offset carriers and 28 dB D/U ratio for offset carriers.[6] However, recent investigations reveal that these two criteria do not, in fact, produce equivalent subjective impairment assessment with the nominal carrier frequency stability typical in LPTV operations. The minimum level of interference protection specified for offset operation is substantially inferior to that specified for non-offset operation and could thus result in situations with unacceptable levels of objectionable interference.

II. New Investigations Show That a 28 dB D/U Ratio for Offset Co-channel Stations Is Not Acceptable Without Precise Frequency Control.

The notion of a minimum acceptable co-channel protection ratio of 45 dB for non-offset operation and 28 dB for offset carrier operation was originally reported by the Commission in the Sixth Report and Order adopted on April 11, 1952.[7] The Commission first considered the use of offset carriers for reducing the effects of interference in LPTV operations in the original LPTV proceeding in 1981.[8] In the Further Notice in that proceeding, the Commission described and illustrated the principle of using offset carriers for reducing the objectionability of co-channel interference,[9] referencing work from 1950.[10] The

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[6] See 47 C.F.R. §74.705(d)(1).

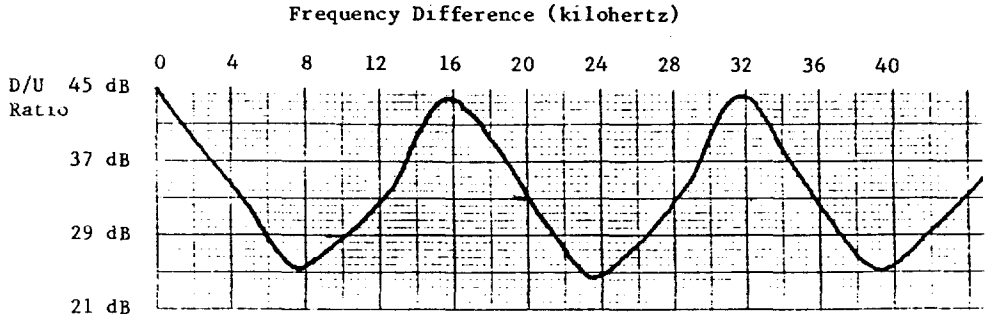
[7] 41 FCC 148, 177 (1952).

[8] See Further Notice of Proposed Rule Making in BC Docket No. 78-253, 46 Fed. Reg. 46, 147 (Sept. 17, 1981) ("Further Notice").

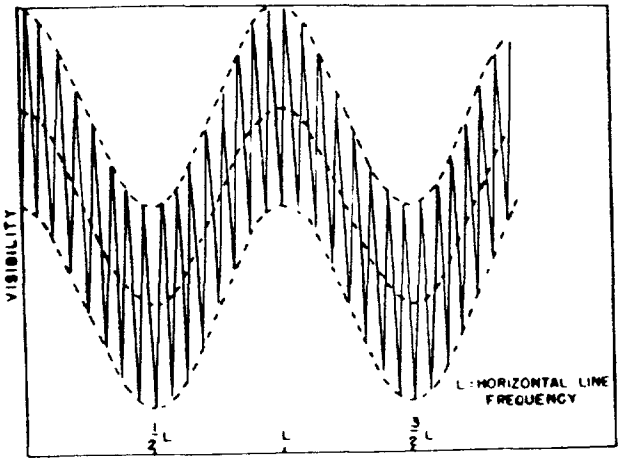
[9] See id., ¶11.

[10] See id., n. 9 (referencing the January 1950 RCA Report entitled A Study of Co-channel and Adjacent Channel Interference of Television Signals, Part 1).

illustration from the Further Notice, showing the minimum co-channel D/U ratio as a function of frequency offset, is shown below:



The illustration above shows only the general principle that offset carrier operation is of greatest benefit when the offset frequency is equal to an odd number times one half the line frequency. In addition to these gross maxima and minima, there are also fine grain maxima and minima which occur when the frequency offset is a multiple of the frame frequency (29.97 Hz) as shown in the illustration below:[11]



[11] See NAB Engineering Handbook, 8th Edition, at 508.

The fine grain minima occur at even multiples of the frame frequency and the maxima occur at odd multiples of the frame frequency. Achieving the benefits of such precise carrier offset requires that carrier frequencies be stable within approximately 5 Hz.[12] Under the LPTV rules, in order to be authorized for the reduced protection criteria associated with offset carrier operation, the visual carrier must be maintained within 1 kHz of the assigned channel carrier frequency.[13] Precise frequency control is currently not practiced in LPTV operations.

Recent investigations show that the 28 dB co-channel D/U ratio with offset carriers does not provide pictures considered acceptable for satisfactory television viewing unless such precise frequency offset is employed. Attached to this filing as Appendix I is documentation from the Advanced Television Test Center ("ATTC") in Alexandria, Virginia, and the Advanced Television Evaluation Laboratory ("ATEL") in Ottawa, Canada dated July 1992. This documentation details tests conducted at ATTC and ATEL, at the request of the staff of the FCC Office of Engineering and Technology, which investigated the subjective assessment of two co-channel precision carrier offsets, 10,010 Hz and 10,040 Hz, which were determined to be the "best" and "worst" case offsets for NTSC.[14] The report shows that an impairment rating of "slightly annoying" was achieved with an approximate 28 dB

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[12] See id.

[13] See 47 C.F.R. §74.761(d).

[14] See ATV Test Procedures -- Objective and Transmission Tests, SS/WP-2-0189 Rev. 20 Aug. 91, at 19-1. "Best" and "worst" case offset frequencies were determined as follows. The nearest even multiple of the frame frequency to the nominal 10 kHz offset is 10,010 Hz which can be considered the "best case" offset. Conversely, 10,040 Hz is the nearest odd multiple of the frame frequency and is typical of the "worst case" offset.

D/U ratio for the "best case" of 10,010 Hz precision offset. For the 10,040 Hz "worst case" precision offset, however, a D/U ratio of 28 dB produced an impairment rating very close to "annoying." Thus, considering that LPTV carrier tolerances are allowed to deviate 1 kHz in offset operations[15], the visual impairment assessment of a 28 dB D/U ratio may vary between "slightly annoying" and "annoying." Moreover, the ATTC/ATEL study shows that, under "worst case" conditions, a minimum D/U ratio of almost 40 dB is required to insure an impairment assessment of "slightly annoying."

Based on the above, the co-channel protection ratio of 28 dB is found to be inadequate for non-precise offset carrier operation as is typical in LPTV configurations. The proposal from dLR would result in this inadequate protection criteria being applied more frequently, with consequential new interference being introduced.

III. Summary and Conclusion.

The proposal from dLR to permit an LPTV applicant to propose the addition of an offset, or change an existing offset, of another LPTV station may lead to higher levels of objectionable interference experienced by both full and low power television stations. NAB and MSTV urge the Commission to deny the dLR Petition.

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[15] See n. 13, supra.

Respectfully submitted,

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August 30, 1994

APPENDIX I

1. Letter dated July 22, 1992, from Thomas Gurley (ATTC) and Paul Hearty (ATEL) to Mark Richer, Chairman, FCC ACATS SS/WP2

2. NTSC-to-NTSC Co-Channel Interference Signal Levels Appearing on Video Subjective Rating Tapes (5/19/92)

3. Advanced Television Evaluation Laboratory Record of Test Results for NTSC-to-NTSC Co-Channel Interference (July 1992)

ADVANCED TELEVISION TEST CENTER, INC.

1330 BRADDOCK PLACE SUITE 200 ALEXANDRIA, VIRGINIA 22314-1650
703/739-3850 FAX 703/739-3230

July 22, 1992

Mr. Mark S. Richer
Chairman, SS/WP-2
c/o Public Broadcasting Service
1320 Braddock Place
Alexandria, Virginia 22314

Dear Mark:

At the SS/WP-2 meeting last week (July 14) Messrs. Robert Bromery (FCC), Paul Hearty (ATEL), and Thomas Gurley (ATTC) reported on the recent completion of the "28dB NTSC verification test" which was conducted by ATTC and ATEL at the request of the staff of the FCC/OET. The results of this test, which are not part of any ATV system testing, have also been requested by PS/WP-3. Therefore, by copy of this letter, we are forwarding the results to that Working Party as well.

The procedures for conducting the test were the same as those developed by your Working Party for the testing of the five HDTV systems now under consideration by the Advisory Committee. At ATTC, this included a panel of three expert viewers establishing the range (TOV/Threshold of Visibility to POU/Point of Unusability) over which an NTSC channel 12 interferes with another NTSC channel 12 at a "weak" signal level (-55 dBm). Digital video tape recordings were subsequently made containing the ranged steps. (*Note*: 28 dB D/U steps at both the 10,010 Hz and 10,040 Hz offsets were intentionally included.) These steps are listed in the attached chart ("NTSC-to-NTSC Co-Channel Interference"). The steps were then put into the same two randomized orders as are used for ATV testing--each of the randomizations contained all the steps of both offsets--and were sent to ATEL for evaluation by non-expert viewers.

At ATEL, the resulting determinations are reflected in the attached chart and graph. An explanation of the procedure used with the non-experts is also included.

We understand that SS/WP-2 may wish to have this test redone. Please be advised that both ATTC and ATEL stand ready to support such a request, but it will not be possible to do so until after completion of current

HDTV systems testing (*i..e.* under current plans in the October/November 1992 time frame).

ATTC and ATEL staff would be pleased to answer any questions you may have about the conduct of this special test and we hope the information provided is useful.

Sincerely,

Paul J. Hearty, Director, Advanced Television Evaluation Laboratory

Thomas M. Gurley, Director of Testing Advanced Television Test Center

Attachments

cc: Robert Bromery, FCC
Dale Hatfield, PS/WP-3
Joseph Flaherty, Planning Subcommittee
Irwin Dorros, Systems Subcommittee
Richard Wiley, FCC Advisory Committee
Brian James, CableLabs

NTSC-to-NTSC Co-Channel Interference

SIGNAL LEVELS APPEARING ON VIDEO SUBJECTIVE RATING TAPES (5/19/92)

[Weak (-55 dBm) Desired Signal Level]

(Replacements for Tapes Made on 3/30/92)

TEST	CARRIER OFFSET		UNDESIRED LEVEL (dBm) *(Per PS/WP-6 Randomization)*‡ 1 (SUB-TOV)	2 (TOV)	3 (TOV + 1)	4 (TOV + 2)	5 (TOV + 3)	6 (TOV + 4)	POU (NOT ON TAPE)
CO-N/N (10)	10,010 Hz		-103.02	-101.02	-93.02	-87.02	-82.77	-76.52	-68.02
CO-N/N (40)	10,040 Hz		-83.00*	-114.00	-103.02	-96.00	-87.00	-78.00	-69.05

The ranging and recording for both offsets used Receiver #B-4.

‡ The rating tapes were made from the following randomizations:

D2-CO-N/N-1A (LICS #5851) used Random Sequence 5A
D2-CO-N/N-1B (LICS #5852) used Random Sequence 5B
D2-CO-N/N-2A (LICS #5853) used Random Sequence 6A
D2-CO-N/N-2B (LICS #5854) used Random Sequence 6B

Where the randomization calls for "Level A", the tape contains a 10,010-Hz cut; where the randomization calls for "Level B", the tape contains a 10,040-Hz cut.

* **Note**: At the 10,040-Hz offset, no ranging level was selected corresponding to the 28-dB Desired/Undesired power ratio. Therefore, this ratio was substituted for the "Sub-TOV" level on the tapes.

Legend:

TOV - Threshold of Visibility (per ACATS Test Plan)
POU - Point of Unusability (per ACATS Test Plan)
CO - Co-Channel
N/N - NTSC into NTSC
LICS - ATTC Library Identification Code

ADVANCED TELEVISION EVALUATION LABORATORY

RECORD OF TEST RESULTS FOR NTSC-to-NTSC COCHANNEL INTERFERENCE

July 1992

1.0 SUMMARY OF METHOD

In this test, non-expert viewers compared an NTSC picture, as received at -55 dBm when not subjected to co-channel interference, with the same picture, as received at -55 dBm when subjected to a measured amount of co-channel interference from an NTSC source (i.e., with a decreased desired-to-undesired ratio). The viewers judged the visibility and the severity of impairment due to different desired-to-undesired ratios.

2.0 DESCRIPTION OF RESULTS

The test examined two carrier offsets: 10,010 Hz and 10,040 Hz. At 10,010 Hz, judgements varied approximately from "imperceptible" to "very annoying" over a range of about 25 dBm. Interference levels for judgements of "perceptible, but not annoying" and "slightly annoying" were -87.23 dBm and -82.55 dBm, respectively (D/Us of 32.23 and 27.55 dB). At 10,040 Hz, judgements varied approximately from "imperceptible" to "very annoying" over a range of about 35 dBm. Interference levels for judgements of "perceptible, but not annoying" and "slightly annoying" were -105.26 dBm and -94.63 dBm, respectively (D/Us of 50.26 and 39.63 dB) (see attached TABLE and FIGURE).

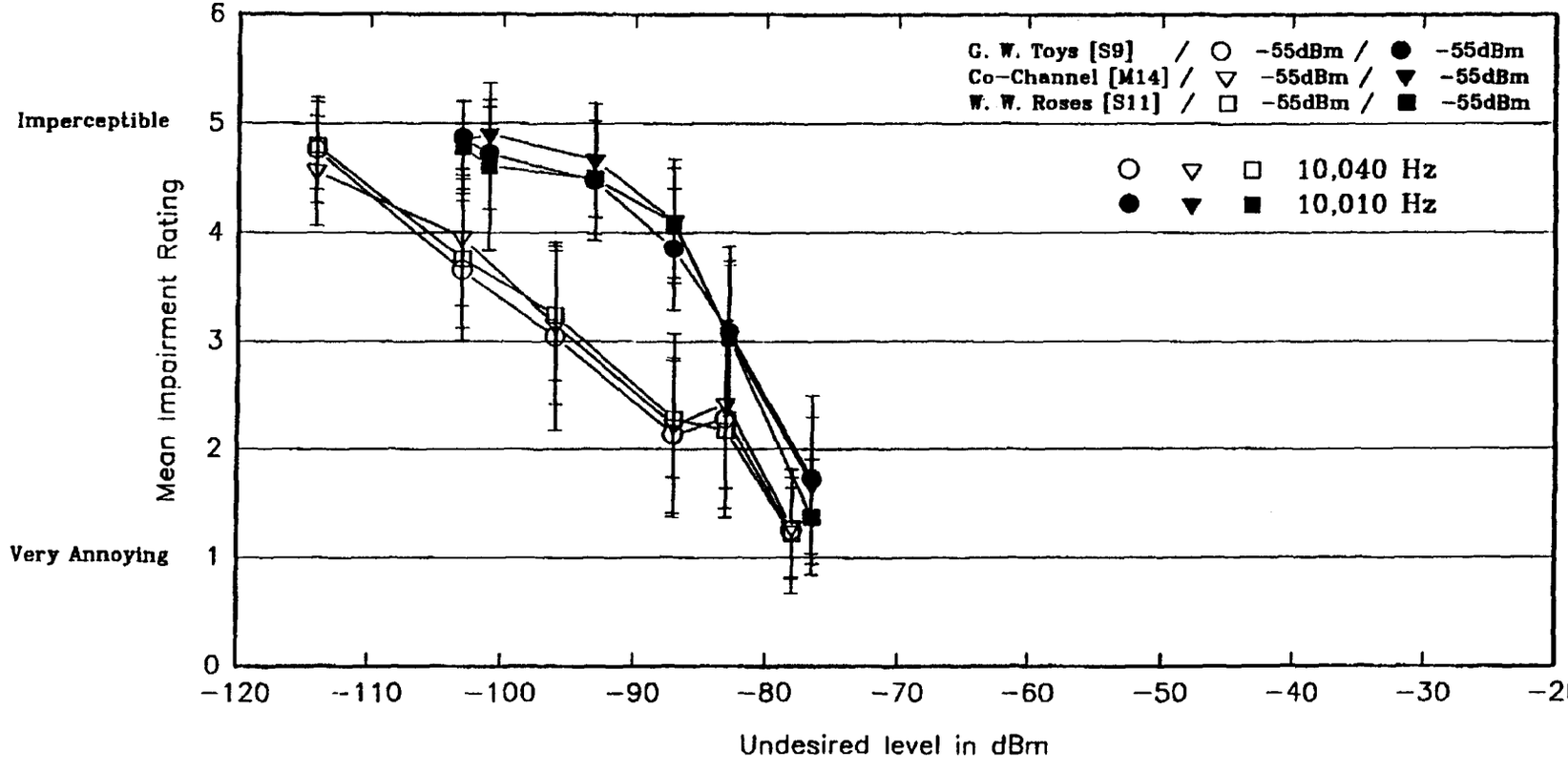
CO-CHANNEL INTERFERENCE (NTSC-TO-NTSC)

IMPAIRMENT/INTERFERENCE TEST	TEST ITEM	INTERPOLATED LEVEL OF IMPAIRMENT (in dBm)				NOTES
		FOR MEAN RATING OF 4.0		FOR MEAN RATING OF 3.0		
		MEAN LEVEL	ST. DEV	MEAN LEVEL	ST. DEV	
CO-CHANNEL (N/N, -55 dBm, 10,040 Hz offset)	all	-105.26	01.39	-94.63	00.93	
G. w. TOYS (-55 dBm)	S 09	-106.482	n/a	-95.60	n/a	
CO-CHANNEL (-55 dBm)	M 14	-103.74	n/a	-94.55	n/a	
W. w. ROSES (-55 dBm)	S 11	-105.55	n/a	-93.75	n/a	
CO-CHANNEL (N/N, -55 dBm, 10,010 Hz offset)	all	-87.23	01.05	-82.55	00.17	
G. w. TOYS (-55 dBm)	S 09	-88.45	n/a	-82.36	n/a	
CO-CHANNEL (-55 dBm)	M 14	-86.58	n/a	-82.59	n/a	
W. w. ROSES (-55 dBm)	S 11	-86.66	n/a	-82.69	n/a	

COMMENTS:

1. Test based on ranging exercise carried out at ATTC on 92. 05. 19.
2. TOVs: -101.02 dBm at 10,010 Hz; -114.00 dBm at 10,040 Hz.
   POUs: - 68.02 dBm at 10,010 Hz; - 69.05 dBm at 10,040 Hz.
3. 66 observations per point (33 viewers x 2 repetitions).
4. For 10,040 Hz, judgements are identical statistically for -87.00 dBm and -83.00 dBm. Inspection of the taped material in these conditions confirms that material is virtually identical at the two undesired levels.
5. Average confidence limits (in dBm): at 10,040 Hz Grade 4.0 ± 1.95 Grade 3.0 ± 2.45
   at 10,010 Hz Grade 4.0 ± 1.42 Grade 3.0 ± 0.76
6. First significant increase in judged impairment (interpolated, in dBm):
   at 10,040 Hz -112.09 (S09) -110.08 (M14) -112.36 (S11)
   at 10,010 Hz - 98.49 (S09) - 92.73 (M14) - 99.98 (S11).

CO-CHANNEL INTERFERENCE (NTSC-to-NTSC)



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4. For 10,040 Hz, judgements are identical statistically for -87.00 dBm and -83.00 dBm. Inspection of the taped material in these conditions confirms that material is virtually identical at the two undesired levels.

ATEL

CERTIFICATE OF SERVICE

I, Judith L. Gerber, do hereby certify that a true and correct copy of the foregoing "Comments of the National Association of Broadcasters" in ET Docket No. 94-45 was sent, via first class mail, on this date, August 24, 1994, to the following:

Louis R. du Treil
John A. Lundin
Ronald D. Rackley
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240 N. Washington Blvd.
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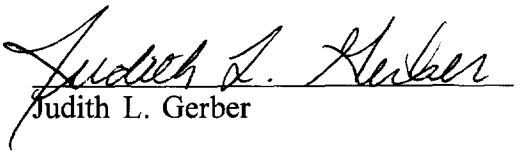
Sarasota, FL 34236.



Judith L. Gerber